



# Theme 3

## ANCIENT TECHNOLOGY

### Tools of the Trade

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Stone technology uses raw materials to provide tools for daily survival.

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Ann M. Johnson is an archaeologist who studies ancient technology.

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##### **Who Is an Archaeologist Who Studies Ancient Technology?**

Troy Helmick is an archaeologist who studies ancient technology.

### LESSON 3A—NARRATIVE: WHAT IS ANCIENT STONE TECHNOLOGY?

*Stone technology uses raw materials to provide tools for daily survival.*

**T**echnology is the manufacture and use of tools to cope with daily life. Today, technology includes everything from kitchen knives to computers. It includes the processing and packaging of foods in our grocery stores. It is responsible for our society's ability to land a spacecraft on Mars. Tools make our lives easier, more efficient, and better.

In the prehistoric past, tools gave people the ability to survive, just as they do today. Their needs for food, shelter, safety, and expression were exactly the same as ours. But past technology relied on raw materials that are quite different from those commonly used in our modern world.

Ancient technology depended heavily upon the use of **stone**. Stone is an **inorganic** material that survives in soil for thousands of years. Stone tools are found in archaeological sites throughout the world, including Montana. Tools made of stone are the most common kind of artifacts studied by archaeologists. The word **lithic** (from the Greek word *lithos*) refers to objects made of stone, as in **Paleolithic**, the Old Stone Age.

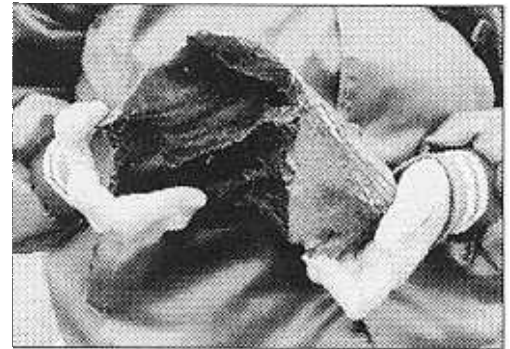
The earliest known stone tools in the world were **pebble tools**. They were made by very primitive humans in Africa some two million years ago. They are intentionally broken rocks with edges that indicate that they were used as tools. These early humans used pebble tools for crushing animal bones. About five hundred thousand years ago, more advanced human groups in Europe and Asia depended on the

stone **hand-axe**.

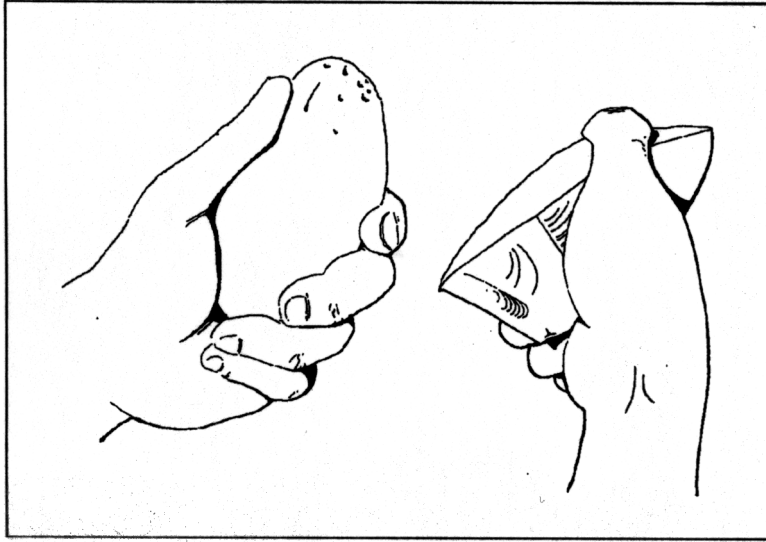
One end of the hand-axe was shaped into a point. It was used in hunting, food preparation, and many other tasks. Later, prehistoric people made more

refined stone **blade and core** tools, in which long, narrow flakes (blades) were created from a prepared piece of lithic raw material (core). The earliest prehistoric groups who migrated to North America and Montana brought this sophisticated **stone tool technology** with them.

The earliest Montana stone tools are about twelve thousand years old. They are beautiful **spear points**. Stone tool use continued here until about two hundred years ago. Great skill was required to make stone tools. Ancient people selected special kinds of stone that were easy to work, but kept a sharp edge. **Chert** (sometimes referred to as "chalcedony," "flint" or "agate") is such a stone. Raw chert comes in a variety of colors—brown, yellow, red, green, and even blue. A useful quality of chert is that even-sized flakes can be removed from it—in a controlled manner—by carefully striking its edge with another rock or piece of antler. Prehistoric people sometimes baked or heated chert in fire pits dug into the ground. This process of **heat treatment** drew out the water in the rock and made it easier to work. **Obsidian, basalt, and**



This large block of black basalt shows evidence of percussion flaking. It comes from a prehistoric quarry near McAllister in southwestern Montana. *Courtesy Montana Archaeological Society.*



"Knapping" is the process of making stone tools by flaking special kinds of rocks.

Percussion flaking involves using a hammerstone (left hand) to strike a block of stone that can be chipped, sometimes called a "core" (right hand). *Courtesy Kootenai National Forest.*

**porcelanite** are other types of stone used by prehistoric people in Montana. Obsidian and basalt are volcanic in origin and are usually black in color.

Many kinds of raw **toolstone** are found throughout Montana. A **quarry** is a specific place where people obtained this toolstone. Prehistoric people often traveled great distances to collect particular kinds of toolstone. One of the places they got obsidian, for example, was Obsidian Cliff in Yellowstone National Park. But these early people also gathered other toolstone, especially chert, on mountainsides and in riverbeds wherever they encountered it in Montana.

The crafting of stone tools by carefully removing pieces of material is called **knapping**, or sometimes "flintknapping" (even though other stones besides flint were used). Prehistoric people used a fist-sized rock called a **hammerstone** to craft raw stone into tools. With a hammerstone or large piece of antler, prehistoric **flintknappers** carefully chipped away excess material like modern-day sculptors. This is called **percussion flaking**. It gave a rough shape to the

tool. Then the flintknappers used antler tools in **pressure flaking** the stone into a finished, sharp tool. If a piece of flint broke in the wrong place while being worked, it was either reworked or discarded. Archaeologists find waste flakes or "chips" at sites where ancient people knapped stone. Many primitive-looking tools found near quarries were probably made by children or adults who were just learning to make stone tools.

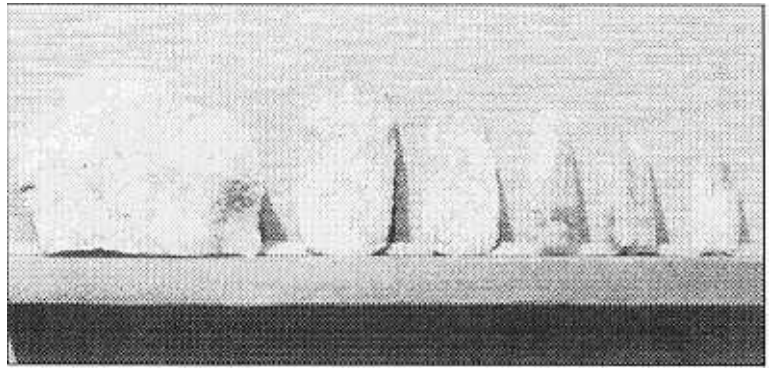
Some stone tools were designed specifically for hunting, butchering, hide working, or cutting. Others served multiple purposes. Unshaped flakes of chert and obsidian were often used for a single task, and then discarded. Hunting weapons required stone **projectile points**, often called "arrowheads." Stone projectile points were **hafted**, or tied with **sinew**, onto a wooden shaft. The earliest people in Montana used **spear points** from twelve thousand to nine thousand years ago. These hunters needed to get very close to animals in order to kill them with a spear. Some archeological sites with very old spear points have been found in Montana. These include the Anzick Site near Wilsall, the Mill Iron Site near Broadus, and the McHaffie Site near Helena.

About nine thousand years ago, Montana's prehistoric groups began to use the **atlatl**, or dart thrower, to throw long narrow darts tipped with projectile points. The atlatl featured a wooden throwing board in which the dart was placed. Throwing an atlatl was like swinging a tennis racket over one's head and propelling the dart at a target. A hunter had to stand and put his entire body into motion to propel

the dart. Because it had a much greater range than earlier weapons, the atlatl allowed hunters to distance themselves from their prey, making hunting much safer. Parts of atlatls have been found in a few cave sites in Montana, but usually only the stone tips have been preserved. Prehistoric people made stone atlatl projectile points of many shapes. Some styles relate to particular time periods. Depending on the style or styles found at a particular site, archaeologists can then estimate the site's age and **chronology**—its placement in time. Today, atlatl enthusiasts hold contests to test their skill using this ancient weapon.

Prehistoric people in Montana used the atlatl until about two thousand years ago. Then the **bow and arrow** (using true "arrowheads") replaced it as the preferred hunting weapon. The bow and arrow had advantages over the atlatl. This new weapon could shoot longer distances with greater accuracy. And it required less movement by the hunter, making it less likely that the animals being hunted would be startled and run away. Montana Indians continued to use the bow and arrow until the late 1800s, even after guns were introduced.

Most projectile points and other stone tools that people find today were not lost by prehistoric people. They were thrown away and replaced when they were no longer usable. Projectile points were used like pencils are today. When a pencil point breaks, it is not thrown away. It is resharpened



and used again and again. Ancient hunters also resharpened and reshaped their points until they were beyond repair. Only then did they throw the points away.

Stone tools served many purposes. When a game animal was killed, ancient people used stone **butchering knives** and sharp flakes to cut up the animal. They used stone **scrapers** to clean animal hides. And they used **stone drills** to make holes in wood, bone, and leather. Archaeologists have many technical names for the various types of stone tools.

Because stone is an inorganic material—that is, it does not decay easily—stone artifacts are more abundant than other types of prehistoric artifacts. Remember, if you find an artifact, it is best to leave it in place. If you find an artifact on public land that you think an archaeologist should know about, call your local Forest Service or Bureau of Land Management office, or the State Historic Preservation Office (SHPO) in Helena. Professional archaeologists who work for these organizations study and protect ancient sites.

How to make a projectile point: Select a piece of chert, obsidian, or any other fine-grained stone that, when broken, exhibits a conchoidal fracture (a technical term meaning that it breaks just right!). Strike the stone with a harder stone to break off a large flake, or relatively flat piece like the one on the left. Then shape the flake by chipping off smaller flakes from the sides and surfaces with a rock, a bone fragment, or an antler tip. To finish the point, chip the sides finely to create sharp edges. As a final step, Clovis points were "fluted" by popping a flake off the two faces to make a shallow channel. This point can be fastened directly to a wooden shaft with sinew (animal tendon) and natural glue. *Flintknapper, Alan Stanfill, 1987. Courtesy Montana Historical Society.*

**LESSON 3A—VOCABULARY: WHAT IS ANCIENT STONE TECHNOLOGY?**

atlatl \_\_\_\_\_  
\_\_\_\_\_

basalt \_\_\_\_\_  
\_\_\_\_\_

blade and core \_\_\_\_\_  
\_\_\_\_\_

bow and arrow \_\_\_\_\_  
\_\_\_\_\_

butchering knives \_\_\_\_\_  
\_\_\_\_\_

chert \_\_\_\_\_  
\_\_\_\_\_

chronology \_\_\_\_\_  
\_\_\_\_\_

flintknapper \_\_\_\_\_  
\_\_\_\_\_

flintknapping \_\_\_\_\_  
\_\_\_\_\_

hafted \_\_\_\_\_  
\_\_\_\_\_

hammerstone \_\_\_\_\_  
\_\_\_\_\_

hand-axe \_\_\_\_\_  
\_\_\_\_\_

heat treatment \_\_\_\_\_  
\_\_\_\_\_

inorganic \_\_\_\_\_  
\_\_\_\_\_

knapping \_\_\_\_\_  
\_\_\_\_\_

lithic \_\_\_\_\_  
\_\_\_\_\_

obsidian \_\_\_\_\_  
\_\_\_\_\_

## LESSON 3A—VOCABULARY: WHAT IS ANCIENT STONE TECHNOLOGY? CONTINUED

Palaeolithic \_\_\_\_\_

pebble tools \_\_\_\_\_

perforation making \_\_\_\_\_

point \_\_\_\_\_

pressure flaking \_\_\_\_\_

projectile points \_\_\_\_\_

quartz \_\_\_\_\_

repoint \_\_\_\_\_

spear points \_\_\_\_\_

stone drill \_\_\_\_\_

tool technology \_\_\_\_\_

technology \_\_\_\_\_

toolstone \_\_\_\_\_

## LESSON 3A—ARCH ACTIVITY: TOOL TIME

**Grades:** 3–8

**Time:** 50 minutes

**Content Area:** science, history, and writing

**Who:** whole class and small group

**Materials:**

Technology Tool Kit (optional)

pencils

draft paper

Arch Journal

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### OBJECTIVE AND OUTCOME

- Students will learn how ancient people used natural resources as tools to adapt to their everyday world.
- Students will examine prehistoric tools (from the Technology Tool Kit or pictures of tools if kit is unavailable) and will write down modern analogs to prehistoric tools.
- Students will compare the function of prehistoric tools with their modern-day counterparts.

### ACTIVITY

1. Divide the class into four groups. Instruct each group to select a writer and a presenter. Pass out artifact collections (or pictures) to each group. Give each group a certain class of artifacts (i.e. one group receives flintknapping tools—Artifact Group 1; another hunting tools—Artifact Group 2; another receives butchering and hide processing tools—Artifact Group 3; and the other group manufacturing tools like drills and awls—Artifact Group 4).

2. Have each group look at the artifacts for 5–10 minutes and determine how they might be used. Have them write down on paper the function of the artifacts. Also have them brainstorm what tool we use today with the same function. If we don't have a tool today that compares, have them figure out why not and write it down.

3. Have groups trade artifacts (or pictures) until each group has looked at all four artifact classes.

4. Have each group present their conclusions about what/how the artifacts in one of the groups were used. Also have them talk about modern analogs. Discuss.

5. Once the class discussion has ended, have students write—in their Arch Journal—their conclusions about how prehistoric tools were used and what they learned from this activity. Have them list their conclusions by artifact classes.

### EXTENSIONS

3–5:

- Research vocabulary.

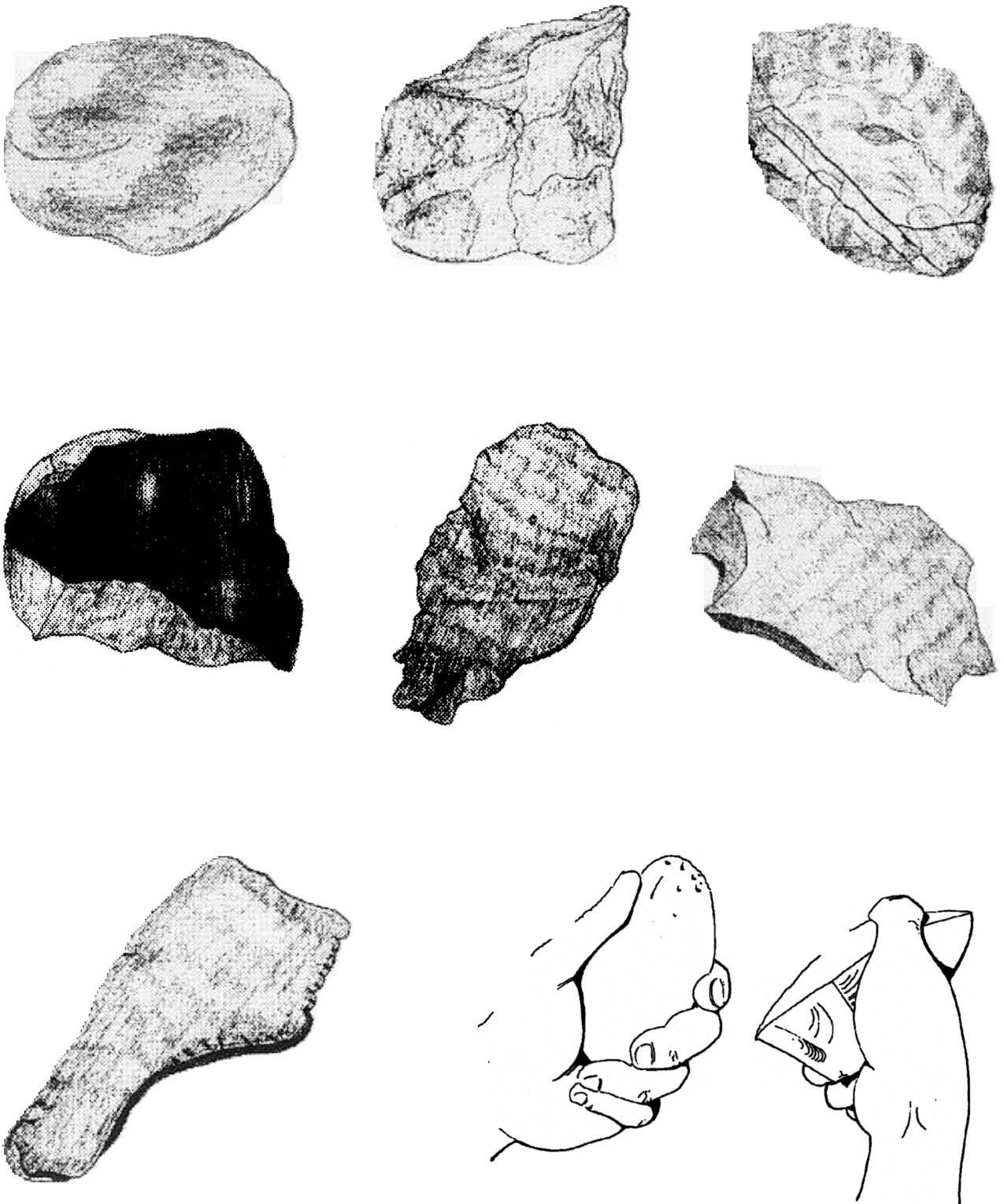
See: Lesson 3A—Vocabulary

6–8:

- Challenge students to place the projectile points in rough chronological order based on the information provided in the narrative. Have them determine whether the points were used with spears, atlatls, or the bow and arrow. Have them assess which technology is the oldest and which is the most recent. Challenge students to read about archaeological sites and the kinds of stone tools found at them.

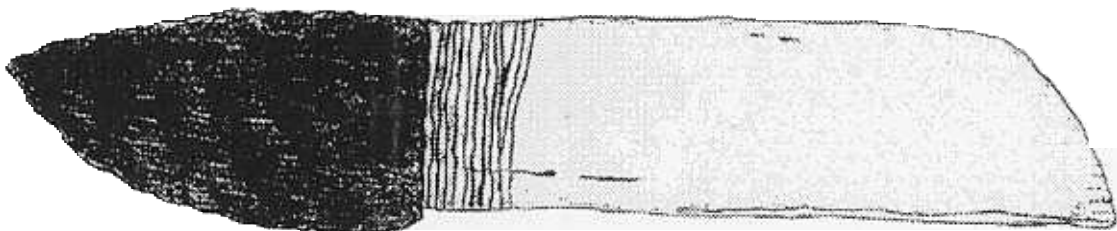
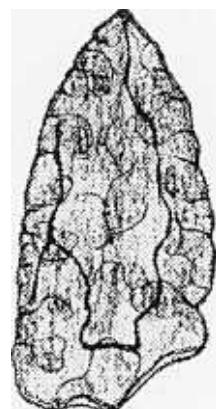
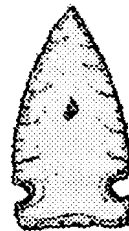
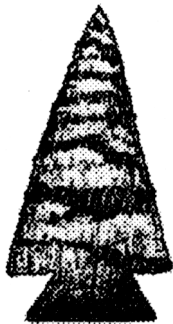
See: *Montana Archaeology Education Resource Catalog*; Student Reading List.

**LESSON 3A—ARCH ACTIVITY: TOOL TIME**  
**GROUP 1**

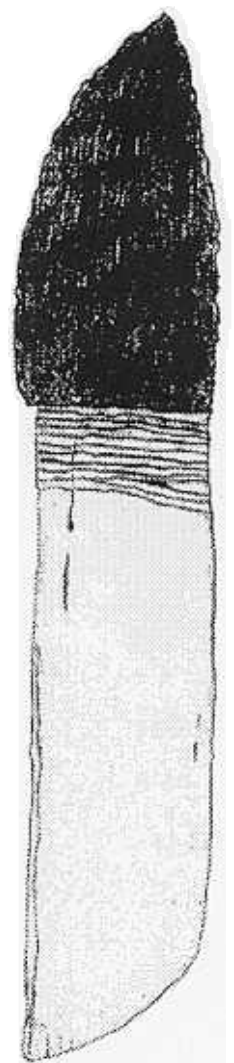
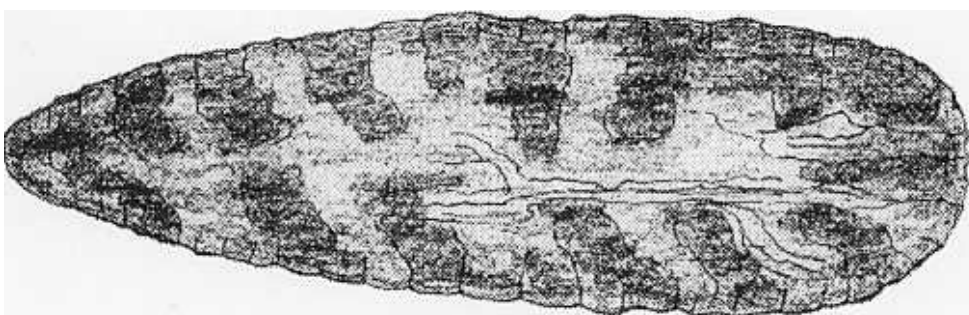
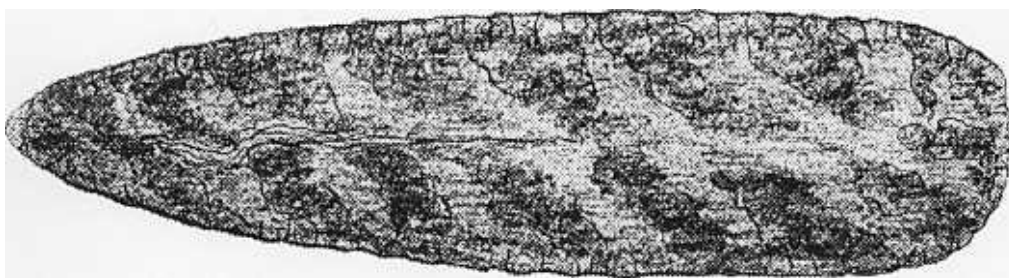
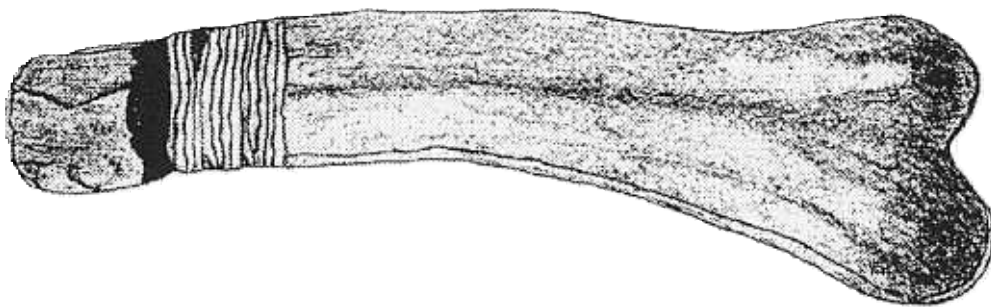




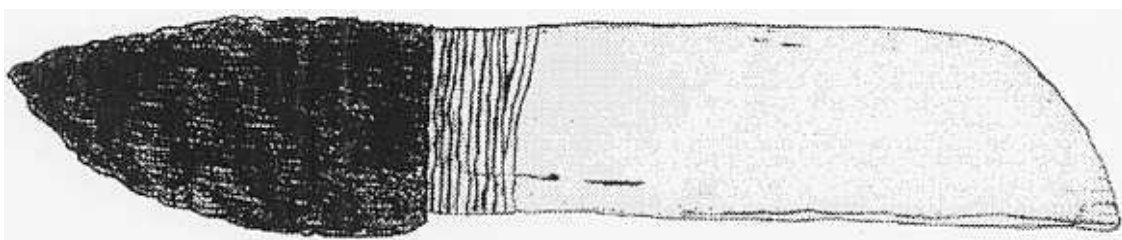
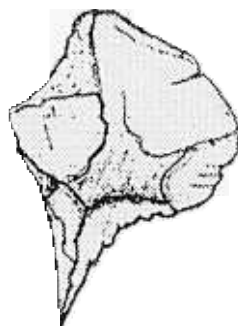
**LESSON 3A—ARCH ACTIVITY: TOOL TIME**  
**GROUP 2**



**LESSON 3A—ARCH ACTIVITY: TOOL TIME**  
**GROUP 3**



**LESSON 3A—ARCH ACTIVITY: TOOL TIME**  
**GROUP 4**



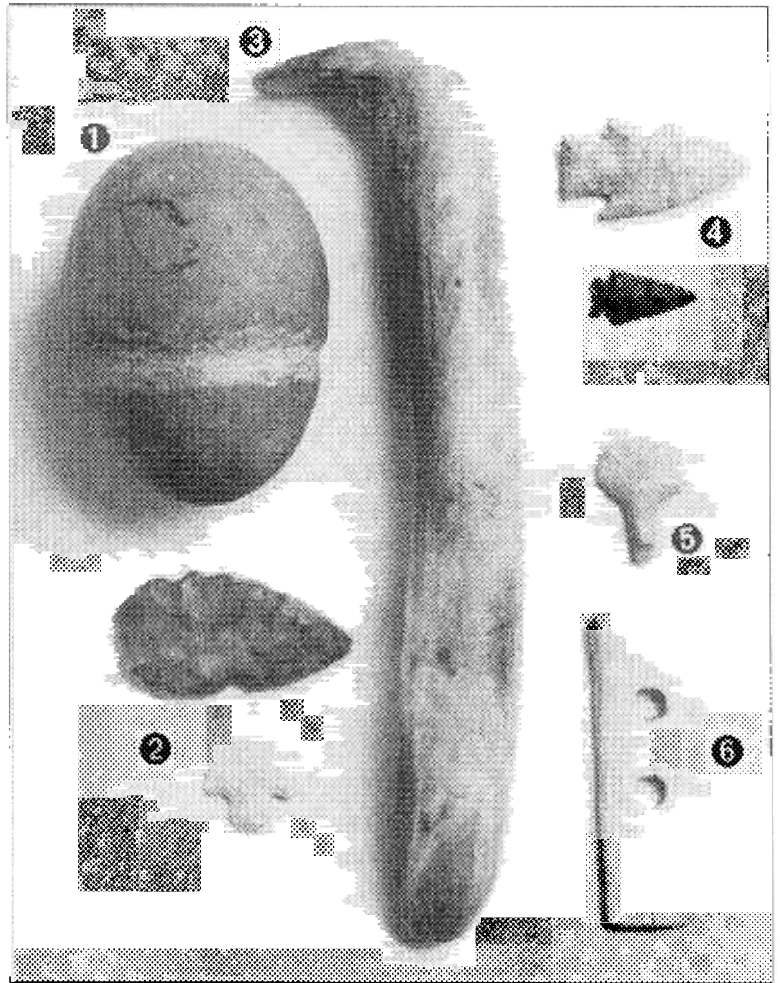
### LESSON 3B—NARRATIVE: WHAT NON-STONE MATERIALS WERE USED FOR ANCIENT TECHNOLOGY?

*Bone, antler, and shell were non-stone materials used for ancient technology.*

Do you ever wonder how people of the past made their clothes without steel needles, thread, or a sewing machine? Ancient people manufactured their clothing, moccasins, containers, and tipi coverings with **bone needles** and **awls**. They used their awls, which were about the size of a modern embroidery needle, to pierce holes in animal hides. Their bone needles, about the size of toothpicks, had a tiny hole in one end just like modern sewing needles. They used **sinew**—animal tendons—and plant twine as thread. One container ancient people made was a **parfleche**. A parfleche was a hide container for storing dried food, clothing, and personal belongings. It was made by sewing together pieces of animal hide, especially from bison.

Ancient people used the fibers of sagebrush, cedar, yucca, and other plants to make string and **cordage**. They used cordage in many ways, just like a modern ball of string. They used it to tie things together and to make **baskets**. Archaeologists rarely find ancient string and cordage in Montana archaeological sites. Sometimes they do find small cordage and basket fragments in caves and rockshelters like Pictograph Cave near Billings in southeastern Montana.

Some ancient people made their fishhooks and fishing harpoons out of bone. These artifacts are not very common in Montana. Here, people caught fish with **nets** and **weirs**.



(Weirs are fences or other enclosures set in a stream to catch fish.) Some Indian tribes—like the Blackfeet—do not like to eat much fish. The ancient people here may have shared this dietary preference. This might explain the absence of fish bones in many Montana archaeological sites.

Ancient people used shaped bone tools to butcher animals and to process hides. Bone was also the material they used to make beads for necklaces. They drilled the holes in their beads with stone drills. They carved, or

Prehistoric people used stone and non-stone organic materials as tools for different activities. Can you guess how the bone tools (#3 and #6 in this group) were used? Courtesy Montana Historical Society.

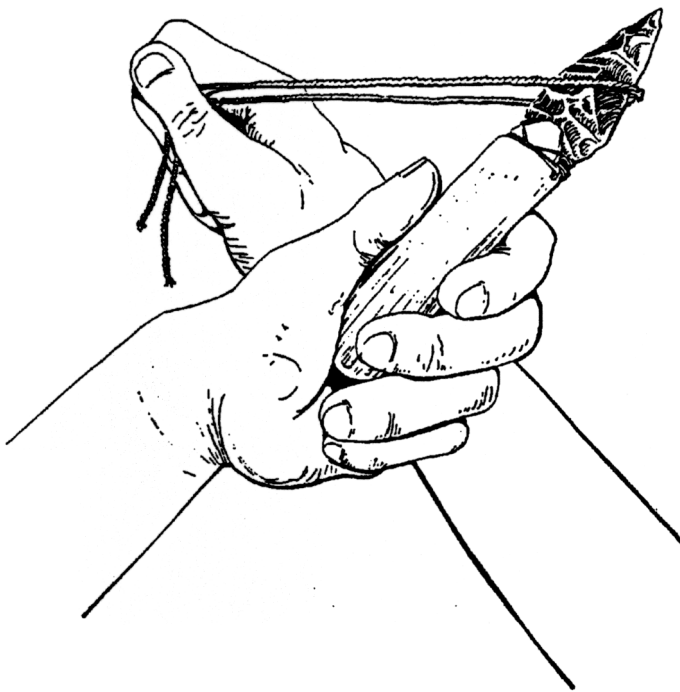
Answer: #3) bone handle for a stone scraper used for working hides. #6) bone shaft straightener—wooden arrow shafts were pulled through the holes to remove curves and bends.



This prehistoric woman uses a slender bone with a tapered tip as an "awl" to make holes in leather for sewing. *Courtesy Kootenai National Forest.*

**incised**, some beads and other bone ornaments with abstract designs. At Pictograph Cave, archaeologists have found bone gaming pieces and a small carved bone turtle **effigy**, or figure. The game pieces are believed to have been used like we use dice today.

Montana's prehistoric people also used shell to make decorative items. They did not travel to the coast to get shells. Instead, they obtained them in **trade** with other tribes who lived closer to the ocean. Archaeologists have found shell beads and ornaments in Montana sites.



A chipped stone blade or point could be hafted to a bone handle to make a knife for cutting cordage made of twisted plant fibers. *Courtesy Kootenai National Forest.*

Ancient people used antler and horn just like they did bone. They used tools made of deer and elk antler for flintknapping, as digging sticks, and as handles for some stone tools like axes and knives. They also used ladles, spoons, bowls, and cooking tongs made of wood and bison horn.

Many of these non-stone artifacts were **perishable**, that is, they were made of **organic** materials—like plants, wood, bone, leather, and antler—that decompose quickly if exposed to air. For this reason, non-stone artifacts are rarely found in Montana. Wind, rain, snow, and the chemical agents in soil cause organic materials to decay over a period of years or tens of years. In Montana, archaeologists have mostly found non-stone artifacts in caves and rockshelters, where they are protected from the weather and do not decay as rapidly. Even so, archaeologists usually only find scraps and pieces of baskets, twine rope, and hide clothing in these sites. In museums, perishable artifacts must be kept in special, temperature-controlled display cases and storage boxes. This prevents further decay and deterioration of these organic artifacts.

Archaeologists get excited when they find leather, wood, antler, or bone artifacts preserved in the archaeological record. Sites with perishable artifacts usually give us more information than sites where only stone tools are found. Finding artifacts made of organic material provides us with a better picture of the range of technologies ancient people used. As archaeologists gain more detail about ancient daily life, they can provide a more complete story of Montana's early peoples.

### **LESSON 3B—VOCABULARY: WHAT NON-STONE MATERIALS WERE USED FOR ANCIENT TECHNOLOGY?**

awl \_\_\_\_\_  
\_\_\_\_\_

baskets \_\_\_\_\_  
\_\_\_\_\_

cordage \_\_\_\_\_  
\_\_\_\_\_

effigy \_\_\_\_\_  
\_\_\_\_\_

incised \_\_\_\_\_  
\_\_\_\_\_

nets \_\_\_\_\_  
\_\_\_\_\_

organic \_\_\_\_\_  
\_\_\_\_\_

parfleche \_\_\_\_\_  
\_\_\_\_\_

perishable \_\_\_\_\_  
\_\_\_\_\_

sinew \_\_\_\_\_  
\_\_\_\_\_

trade \_\_\_\_\_  
\_\_\_\_\_

weirs \_\_\_\_\_  
\_\_\_\_\_

## **LESSON 3B—ARCH ACTIVITY: TOOL TIME II (ANTLER AND BONE)**

### **ACTIVITY**

Follow Lesson 3A—Arch Activity (Tool Time) using antler and bone tools from the Technology Tool Kit (or pictures of them if the kit is unavailable). Follow all procedures, substituting antler and bone tools for the stone tools.

For the enclosed drawings:

Group 1 = hunting tools (atlatl fore-shaft, bone-handle knife, bone fish-hook)

Group 2 = butchering/hide working tools (bone-handle scraper, bone beamer, bone flesher, bone-handle knife)

Group 3 = knapping tools (antler hard-hammer, antler-tine pressure-flaker, hide pad, hide pad)

Group 4 = manufacturing tools (bone awls, bone needles, pitch stick, sinew)

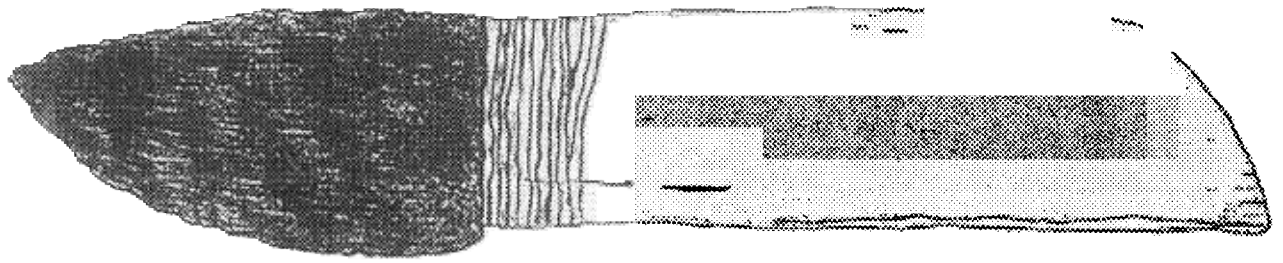
### **EXTENSION**

3–8:

- Research vocabulary

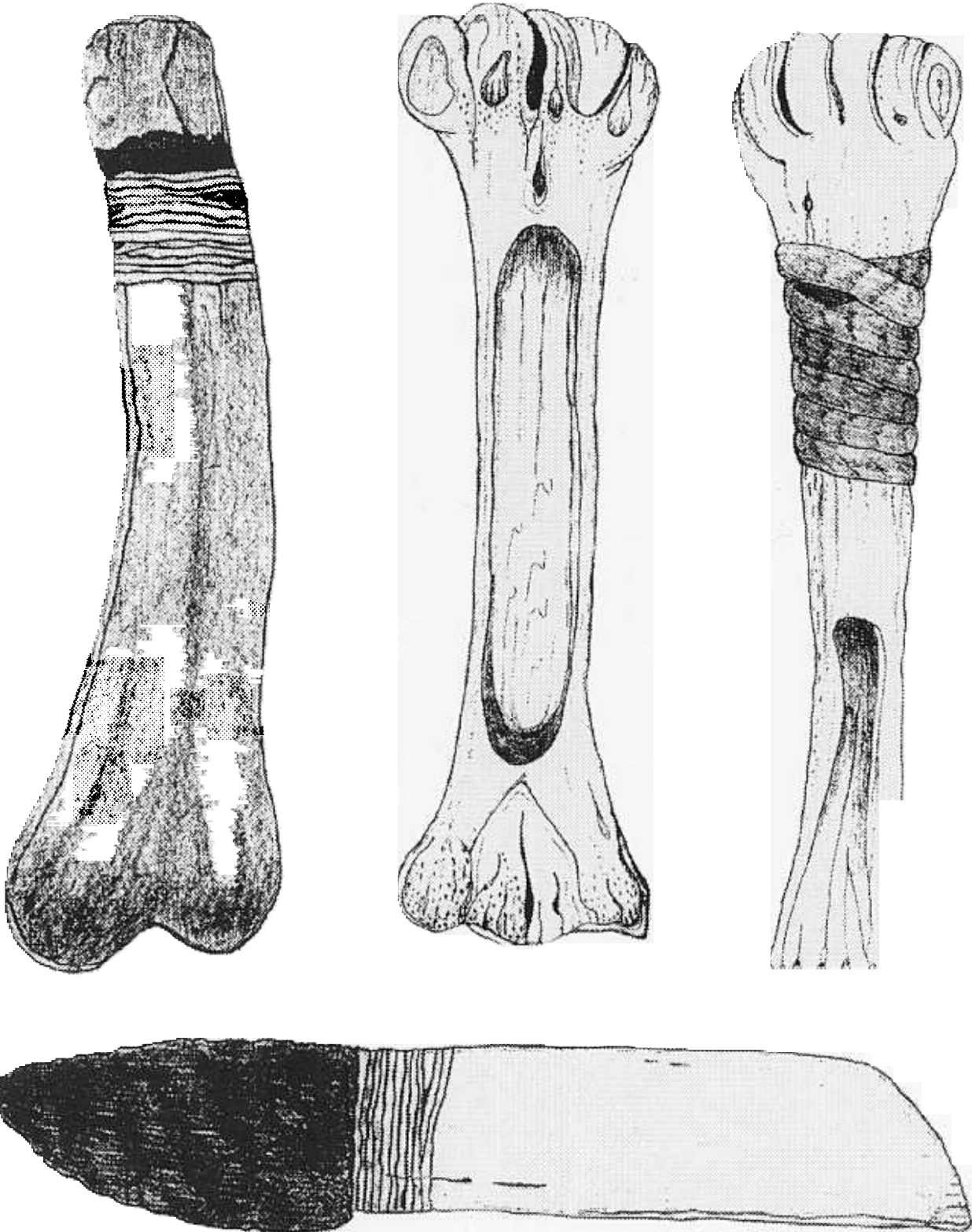
See: Lesson 3B—Vocabulary

**LESSON 3B-4/ACTIVITY: TOOL TIME II**  
**GROUP 1**

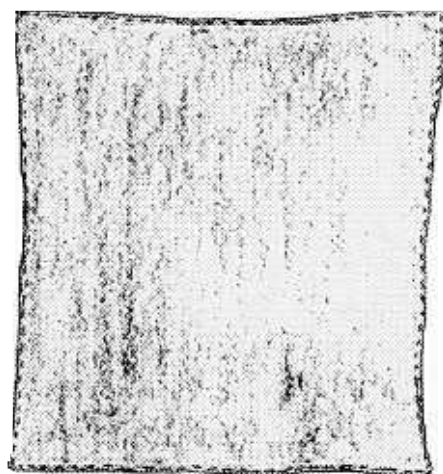
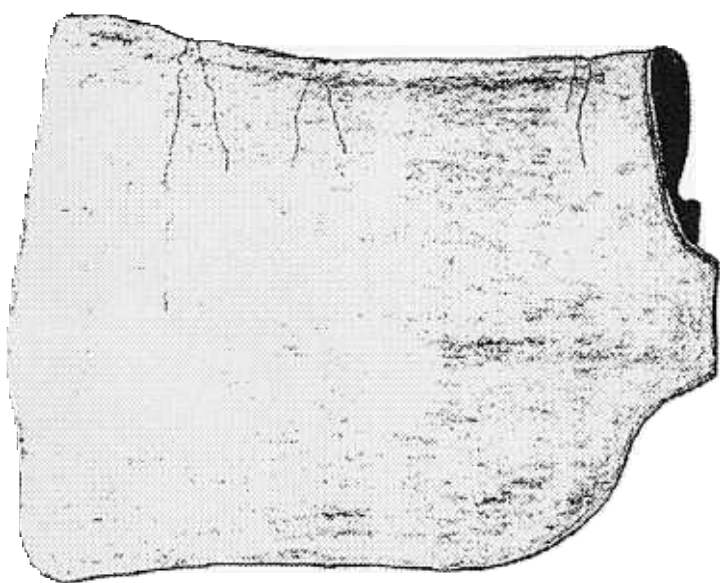
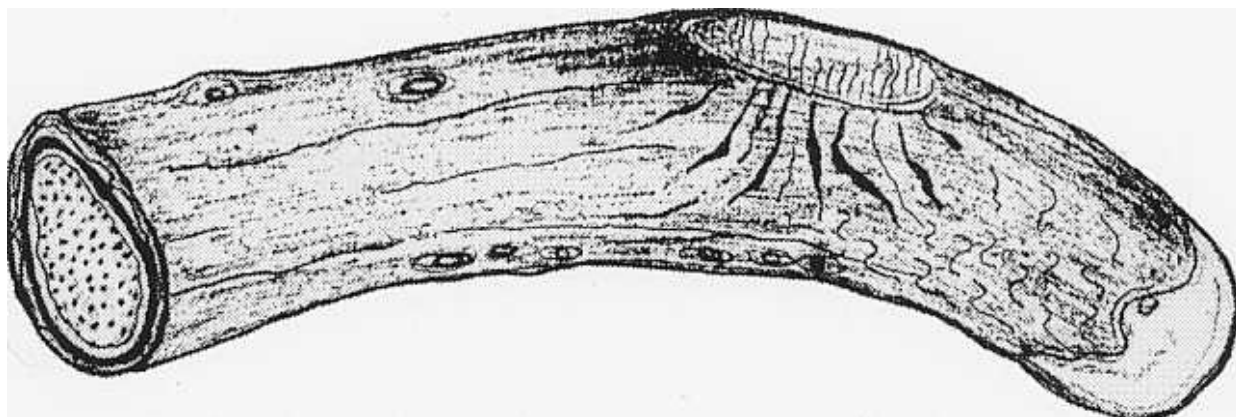




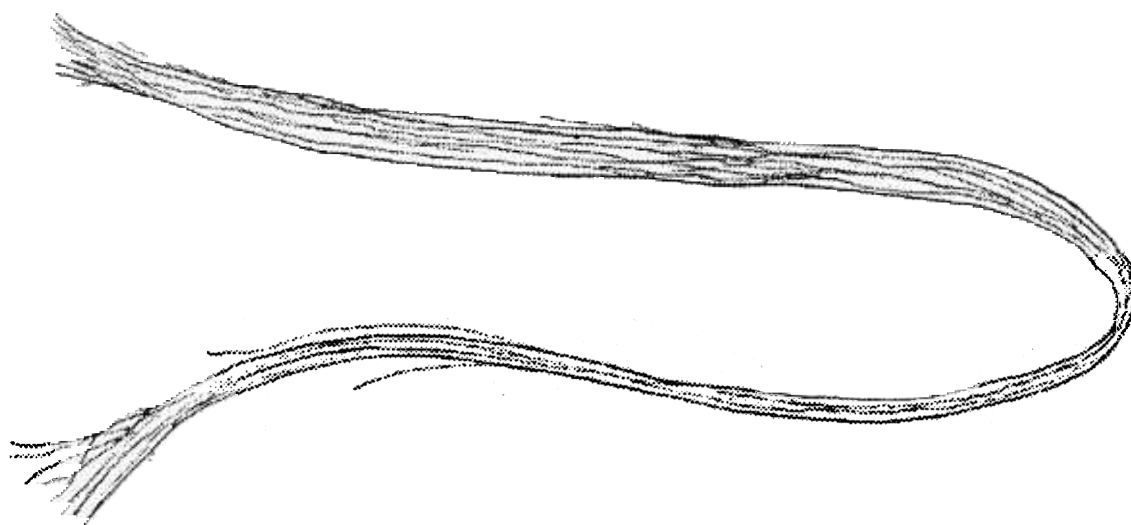
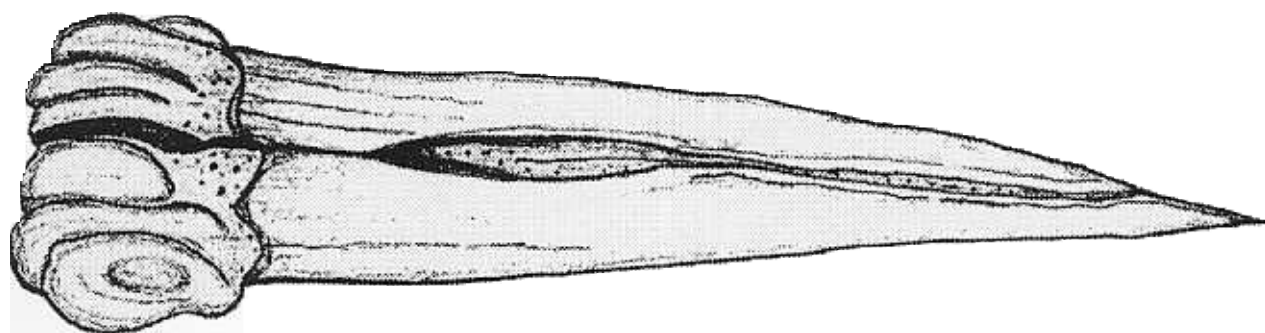
**LESSON 3B-4/ACTIVITY: TOOL TIME II**  
**GROUP 2**



**LESSON 3B-4/ACTIVITY: TOOL TIME II**  
**GROUP 3**



**LESSON 3B-4/ACTIVITY: TOOL TIME II**  
**GROUP 4**



### LESSON 3C—NARRATIVE: WHAT TECHNOLOGY DID ANCIENT PEOPLE USE TO HARVEST AND PROCESS PLANTS?

*Ancient people used stone, bone, wood, and antler tools to harvest and process plants.*

Archaeologists focus on stone and bone artifacts because these are the most common artifacts found at sites. But they sometimes find plants and seeds preserved at prehistoric sites in Montana. These discoveries demonstrate the importance of plant resources to prehistoric peoples. Most seeds and plant remains are found in ancient campfires. They are often charred and hard to identify.

Plants were always a significant food source for Montana's ancient people. Archaeologists find the most evidence of plant food use between 8,000 and 1,500 years ago. Ancient people used plants medicinally to heal wounds and cure sick people. Many modern medicines are made from plants that prehistoric peoples used. Ancient people used rope and twine made from plant fibers for lashing equipment together, tying tipi poles, and as bow string. And they also used plants in ceremonies of all types.

Many types of plants grow across Montana. Some plants were more important to ancient people than others. Knowledge of important plants, and where they could be found, was passed from generation to generation. Women and girls harvested seeds, berries, and roots throughout spring, summer, and fall. This provided important winter food to supplement meat.

Roots, such as **bitterroot** (Montana's

state flower) and **camas**, were dug with a **digging stick**. The digging stick was three to four feet long and made of antler or wood. The digging end was pushed into the ground to move the root up to the surface. It worked like a modern-day dandelion digger. The end of a wooden digging stick was hardened in a campfire. This made the digging end durable and kept it from breaking. The handles of digging sticks were made of deer or elk antler. Styles of digging sticks varied among Montana Indian tribes. Blackfoot Indians used the wood of birch trees for their digging sticks. Other western Montana tribes used hawthorn and serviceberry branches for digging. Digging sticks are rarely found in prehistoric sites. These tools were highly valued and were only left behind when they were broken and could not be repaired.

Ancient people cut branches for digging sticks and poles for structures with **stone knives** and **axes**. They probably used stone flakes and knives to harvest plants like **balsamroot** and **prickly pear cactus** which grow above the ground.

Prehistoric people placed roots and berries on a large, flat grinding stone, called a **metate**. They then mashed the roots and berries with a hand-sized flat rock called a **mano**. This produced juice and pulp. They then dried the pulp into a flour and stored it in skin containers. (They also sometimes used a mortar and pestle to process plant foods.) They



For the ancient people of western Montana, camas was an important food source. They harvested the edible roots of the camas with a digging stick. *Courtesy Kootenai National Forest.*

dried roots and berries whole and stored them in bags. And they sometimes ground dried plants for use as flour. People used this flour in stews or made it into cakes or bread. By mixing together mashed berries, dried meat, and fat, they made **pemmican**. Pemmican provided an important and nutritious food during winter when plants were not available and wild game was not plentiful.

Archaeologists have found plant seeds in prehistoric sites throughout Montana. One of the best finds was in the Barton Gulch site in southwestern Montana.



This woman uses a stone mortar and pestle to grind up roots, berries, and nuts. Some ancient people preferred to use manos and metates. *Courtesy Kootenai National Forest.*

### **LESSON 3C—VOCABULARY: WHAT TECHNOLOGY DID ANCIENT PEOPLE USE TO HARVEST AND PROCESS PLANTS?**

balsamroot \_\_\_\_\_

bitterroot \_\_\_\_\_

camas \_\_\_\_\_

digging sticks \_\_\_\_\_

mano \_\_\_\_\_

metate \_\_\_\_\_

pemmican \_\_\_\_\_

prickly pear cactus \_\_\_\_\_

stone axes \_\_\_\_\_

stone knives \_\_\_\_\_

## LESSON 3C—ARCH ACTIVITY: MAKING PEMMICAN

**Grades:** 3–8

**Time:** half-day (1 hr. to soak; 30 min. to prepare; 2 hrs. to bake)

**Content Area:** science, social studies, and math

**Who:** small groups

**Materials for pemmican:**

12 ounces of thin-strip beef jerky, 2 cups of fresh or frozen blueberries (or raisins), 2 cups of sunflower seed meats, 1/4 cup of soft margarine.

Large mixing bowl and large flat rock that has been *sterilized* to serve as grinding board (metate) and smaller, *sterilized* rock to serve as a masher (mano), 1–2 cookie sheets for drying or baking.

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### OBJECTIVE AND OUTCOME

- Students will learn about the process by which pemmican was made and the ancient technology used to create it.
- Students will make a native food using *sterilized* grinding stones and mixing it by hand. They will then sample the food they have created.

### ACTIVITY

1. Soak the jerky in 1 cup of water for 1 hour.
2. Assign students to groups of three to five. *Have them wash their hands before they begin.* Groups take turns mashing the jerky on the grinding stone. Place ground jerky in bowl. Once jerky is ground, begin to add berries to a bit of the jerky and mash together on the grinding stone. Continue this process until all the jerky and berries are mixed together. Then add sunflower seed meats.
3. Put jerky/berry/sunflower mixture in bowl. Add margarine and mix all together thoroughly. Knead the mixture. It should be the consistency

of trail mix.

4. Place mixture on cookie sheets. Spread flat. Bake at 200 degrees for 2 hours.

5. Eat and enjoy.

NOTE: If you don't have a grinding stone and a stone masher, you can chop the jerky with a knife and put the jerky, blueberries, sunflower seed meats, and margarine in a bowl and mix well.

### EXTENSIONS

3–8:

- Research vocabulary.

See: Lesson 3C—Vocabulary.

- Research other native recipes and foods introduced by American Indians.

- Discuss with the class what these contributions are.

- Find other American Indian recipes such as those for fry bread or wild rice soup. Make and sample these traditional foods.

- Put together a cookbook with 5–15 ancient recipes using traditional foods.

### LESSON 3D—NARRATIVE: WHAT ANCIENT TECHNOLOGY ASSISTED IN FOOD PREPARATION?

*Pottery and containers made of animal hides assisted in food preparation.*

Imagine the difficulty of preparing a family meal without dishes and silverware. Think of the dangers in cooking food over a hot stove or fire without kitchen pots and pans. Euro-Americans brought metal pots and pans and china to Montana only two hundred years ago. Before that, ancient people created their cooking and eating containers from raw materials found in nature.

For thousands of years, people roasted animal meat of all kinds over an open campfire. They also used animal hides as cooking pots, boiling meats and vegetables in **hide containers**. But if they placed a hide container directly over a fire, it would burn. Instead, they heated rocks in a fire pit and dropped them inside the hide container. Water, meat, and vegetables, previously placed in the container, began to boil when the hot rocks were added. The boiling water then cooked the food, creating a nourishing stew or soup (once the rocks were removed!). This method of cooking is called **stone-boiling**. Because they were light and easy to carry, cooking containers made of animal hide were very useful for ancient people who traveled many miles during the year.

A few prehistoric Indian groups in Montana also made **pottery** out of clay. These people used pottery for food storage and for cooking. Archaeologists believe that ancient people from areas east, north, and

south of the Montana plains brought pottery technology with them. These pottery makers may be the ancestors of the Crow, Blackfeet, and Shoshone Indians. They made pots by **coiling** strings of clay together. Other pots were simply **lump-modeled** by hand-shaping a ball of clay. Ancient potters smoothed the walls, or sides, of a pot by a **paddle and anvil technique**, where the exterior wall was paddled with a wooden paddle while using a hand inside as an anvil. The pots were then covered with dirt and campfire ash, and the potters built a fire over the top of them. This heated, or fired, the pots to make them hard and improve their durability.

Prehistoric potters in Montana made a variety of pottery shapes. They often decorated their pots with simple impressions and designs, but they did not paint them. Archaeologists rarely find whole pots in Montana. Broken pieces of pottery, called **sherds**, are usually all that remain at sites such as Ulm Pishkun State Park near Great Falls. Pottery, like the bow and arrow, is a relatively recent technology among Montana's ancient people. Some of the oldest pot sherds found in Montana come from the Myers-Hindman site in southwestern Montana. These remains are dated to 740 years ago. The Montana Historical Society Museum and many local county museums exhibit pottery made by prehistoric Montana Indians.

Vessels made from carved **steatite**

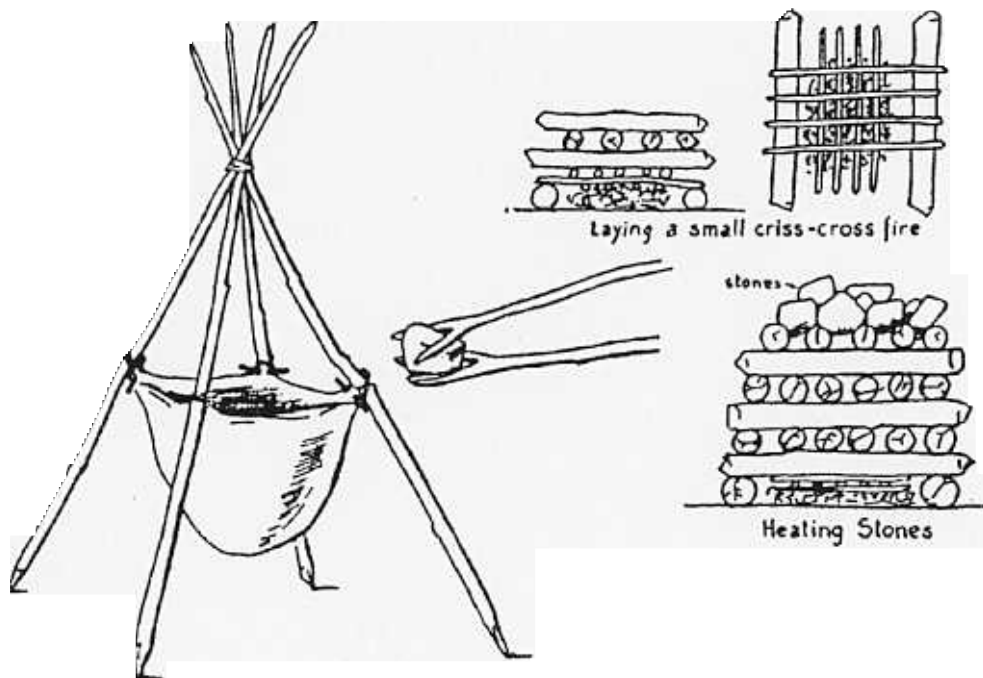


are also found in Montana. Steatite is "soapstone" (talc) found in certain locations in southwestern Montana. Steatite vessels are the same size and shape as fired clay pots and are believed to have been used for similar purposes. Ancient people also made basket containers from coiled or woven pieces of plant materials. These were used as bowls and for seed **parching trays** and are similar to those found in the **Great Basin** (Idaho, Utah, Nevada) region. The Kootenai and Salish Indians—and probably other prehistoric groups in western Montana—made containers of cedar bark, which they used for storing food and other items.

When excavating sites in Montana, archaeologists find the remains of cooking fires and sometimes the bones and charred plant scraps of ancient meals. Ancient people ate their meals around a fire

hearth, while seated on hides and plant fiber mats. They had no tables or chairs. Except for pottery, archaeologists rarely find "kitchen gear." Because so few artifacts relating to food survive, archaeologists must infer what ancient Indian meals were like from the records written by and about historic Indians. Prehistoric people probably ate their food with their fingers or with horn or wooden utensils and bowls. Their principal fare was roasted or boiled meat in the good times. Baked or boiled roots, fresh greens such as wild onions, berries, and other fruit balanced many meals. In lean times, they consumed a gruel of root flour mixed with available game. For many groups, late winter through early spring was the "starving time." Then they had to rely on stored foods until spring brought new plants and game was once again plentiful.

Cooking in hide containers could not be done directly over a fire. Instead, the cooking was done "inside-out" by placing rocks heated in the fire into the hide container filled with water, meat, and vegetables. The water then boiled, making a flavorful stew or soup. *Courtesy Kootenai National Forest*



### **LESSON 3D—VOCABULARY: WHAT ANCIENT TECHNOLOGY ASSISTED IN FOOD PREPARATION?**

coiling \_\_\_\_\_  
\_\_\_\_\_

Great Basin \_\_\_\_\_  
\_\_\_\_\_

hide containers \_\_\_\_\_  
\_\_\_\_\_

lump-modeled \_\_\_\_\_  
\_\_\_\_\_

paddle and anvil technique \_\_\_\_\_  
\_\_\_\_\_

parching tray \_\_\_\_\_  
\_\_\_\_\_

pottery \_\_\_\_\_  
\_\_\_\_\_

sherds \_\_\_\_\_  
\_\_\_\_\_

steatite \_\_\_\_\_  
\_\_\_\_\_

stone-boiling \_\_\_\_\_  
\_\_\_\_\_

## LESSON 3D—ARCH ACTIVITY: ANCIENT POTTERY

**Grades:** 3–8

**Time:** 60 minutes+

**Content Area:** science, history, and art

**Who:** whole class and individual

**Materials:**

clay, moist plastic tubs, small containers for water and slip, plastic bags, popsicle sticks, sandpaper, wrapped “paddle,” plastic utensils, comb, heavy cardboard pieces or container lids to make pots on, sponges for cleaning up.

**Optional:**

acrylic gesso for sealing finished pot.

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### OBJECTIVE AND OUTCOME

- Students will learn the materials and process of a form of prehistoric technology.
- Students will make coiled pots similar to those found in archaeological sites in Montana.

### ACTIVITY

1. Inform students they will be making pottery by hand, an ancient form of technology.

2. Cover desk areas with plastic. Make sure students have access to water. Begin by giving each student a ball of clay (about the size of a tennis ball).

3. Have students break clay into five smaller balls. Then have them gently mold the clay into round strips or coils. Have them start with both hands together—and then gradually move their hands apart. Roll clay on a coarse cloth or plywood to prevent it from sticking. Be sure to make the coils long enough so that they don’t have too many to piece together.

4. After making four coils, take the fifth ball of clay and make it into a flat patty. This becomes the base or plat-

form for the pot. Place the base on a surface you can move, such as heavy cardboard, a plastic container lid, etc. Using a fork or comb, scratch a series of marks onto the base and put on a little very moist clay. This will help the first coil to stick to the base.

5. Gradually add coils to create height. The students may smooth the interior surface with their fingers or a paddle, or they can leave evidence of the coils to show the method of construction. Allow some time for one coil to set or dry partially before placing another coil on top, or the pot will collapse.

6. Once the pot is built, it is up to the student how he or she wants to treat the pot’s outside surface. It can be smoothed, carved, or incised using utensils. When the pot is about as hard as leather, it can be smoothed with a pebble, marble, or fingernail. It can also be incised with shallow lines or otherwise decorated. When the pot is bone dry, the student can smooth it with sandpaper.

7. Once the pot is bone dry, it can be covered with acrylic gesso to seal the surface. If you have a kiln avail-

able, you may also fire it. Do not apply acrylic gesso if you fire the pot.

#### **EXTENSIONS**

3–5:

- Research Vocabulary.

See: Lesson 3D—Vocabulary.

3–8:

- Separate students into groups of four, and give them fragments from four pottery vessels. Ask them if they can fit them together. Give them 15 minutes to put the pots together. Ask them the shape of the vessel based on the fragments they could put together. Have them draw what they suspect is the shape of the entire vessel.

6–8:

- Challenge students to read about ancient pottery and where and how long ago it was first used in parts of the world. Ask them to find out when the first pottery was made.

- Challenge students to research dating methods for pottery.

### LESSON 3E—NARRATIVE: HOW WAS ANCIENT ART CREATED?

*Ancient people used technology to  
create art to express themselves.*

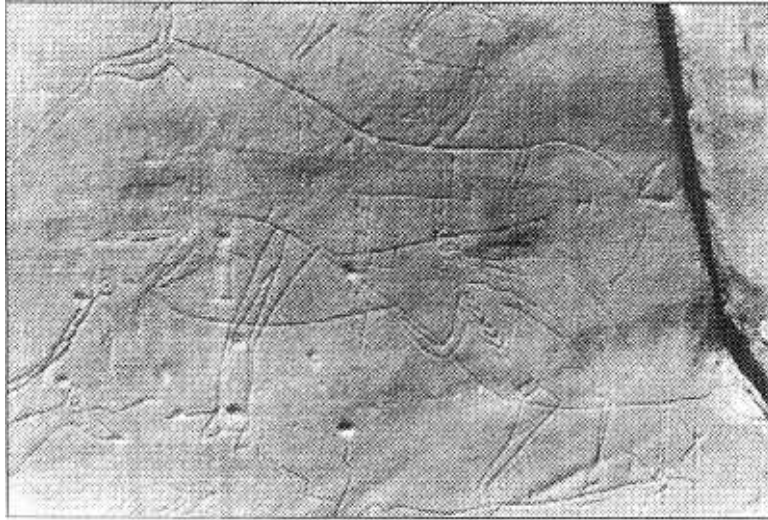
W<sup>hen</sup>

a modern-day billboard printed with messages for all to see. Others think rock art is more **symbolic**, expressing spiritual and **supernatural** beliefs of ancient people. In North America, rock art is not a true writing system. It does not contain words and cannot be read like Egyptian **hieroglyphics**. Archaeologists study rock art figures, and sometimes patterns emerge. Often a particular rock art style will appear only in a certain region. In central Montana, the rock art images found along the Smith River are believed to be related to religious activities. Many Indian tribes have oral traditions about prehistoric rock art and its spiritual meaning.

Rock art in Montana includes many different kinds of designs. Some



Handprints are a common pictograph motif in central and western Montana rock art. Sometimes they were drawn, and other times, they represent actual hands dipped in red ochre paint. These handprints at the Black Canyon site are actual handprints and show left and right hands, some in pairs. *Mavis and John Greer, photographers.*



There are two basic kinds of rock art: pictographs (painted images) and petroglyphs (carved images). This petroglyph of warriors on horseback is in the biographical style that became common in the Protohistoric Period. *Edrie Vinson, photographer. Courtesy Montana Historical Society.*

of these designs depict animals and people, while others are abstract. Images of animals—bears, snakes, birds, lizards, turtles, sheep, otter, deer and elk—appear on many rock art panels. Paintings of handprints, animal tracks, and perhaps **clan symbols** (either animal or geometric) may have served to identify a prehistoric group and possibly its **territory**. Throughout Montana and much of the world, ancient rock art typically

depicts humans engaged in the act of hunting with bows and arrows, spears, or atlatls. But in some areas like central Montana, these scenes are absent. Instead, abstract drawings of humans appear. Some of these figures have horns and headdresses and others are shown without arms, hands, or legs. These are believed to be the drawings of a **shaman**. Shamans were ancient religious leaders who gained power through painting or carving special images. In fact, some of the images believed to be painted by shamans were placed on cracks in the rock. The position of these images may represent the passage of the shaman from or into another spirit world.

Based on scientific dating, the oldest rock art in Montana is two thousand years old. In contrast, early rock art in Europe—which displays extinct animals such as mammoth and bison—is thirty thousand years old. The most recent Montana rock art

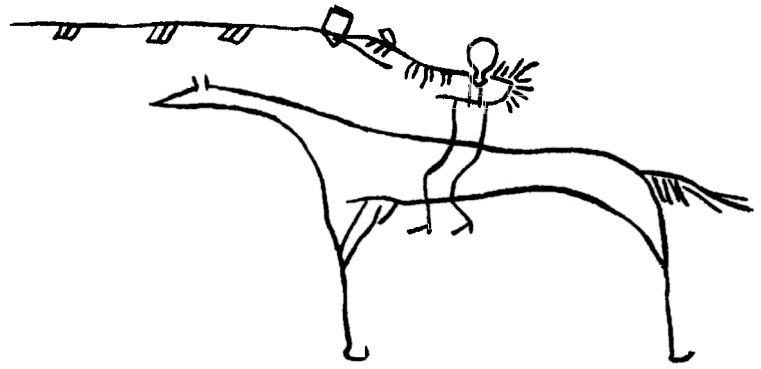
At some rock art sites, many different designs may occur and overlap each other. This suggests that they were made at different times. Here, at the Rock Creek Pictograph Site, you can see paintings of shields, handprints, and human stick figures. What else do you see? *Mavis and John Greer, photographers.*



shows images of horses and guns and appears to record special historical events. This **biographical style** of rock art became common between 1750 and 1900. During this time, the lives of Native Americans were changing rapidly due to the introduction of horses, guns, and other new items by Euro-American explorers and traders. Montana's Indians drew many scenes showing warfare, horse stealing, **counting coup**, and dancing, as well as hunting, during this time of major cultural change.

Ancient people used liquid paints and solid crayons to create their pictographs. They made crayons from raw **pigment**. Pigment in Montana was derived mostly from charcoal or from locally obtained **hematite**, or hardened red clay earth. To make paint, ancient artists ground these and other minerals into a powder. Then they mixed the powder with animal fat until it was very sticky. Besides red and black, Montana rock paintings sometimes include yellow, brown, and green colors. Though many people think pictographs were painted with brushes of animal hair, they were mostly painted using fingers and hands.

Ancient artists carved the lines of petroglyphs with pointed stone tools or



antler tines. Sometimes evidence of pecking with a rock, like a hammer-stone, is seen. Most petroglyphs are found on sandstone, which is softer and smoother than other kinds of rock.

Rock art sites that can be viewed by the public include those found at Missouri Headwaters State Park near Three Forks, at Pictograph Cave State Park southeast of Billings, and at Pompey's Pillar along the Yellowstone River. Remember, rock art is very fragile and vulnerable to touching and scratching. Never trace the rock art with chalk or crayons, even if you want to get a better picture of it with your camera. Many rock art sites are sacred to modern-day Indians. Look and enjoy, but do not touch these ancient and fragile images.

Some rock art can be dated by the type of images portrayed. This depiction of a person on horseback carrying a gun tells us that it was made sometime after A.D. 1700, when these items—the horse and the gun—were first acquired by Montana's native people. *Courtesy Montana Historical Society.*

### LESSON 3E—VOCABULARY: HOW WAS ANCIENT ART CREATED?

biographical style \_\_\_\_\_  
\_\_\_\_\_

clan symbol \_\_\_\_\_  
\_\_\_\_\_

counting coup \_\_\_\_\_  
\_\_\_\_\_

hematite \_\_\_\_\_  
\_\_\_\_\_

hieroglyphics \_\_\_\_\_  
\_\_\_\_\_

petroglyphs \_\_\_\_\_  
\_\_\_\_\_

pictographs \_\_\_\_\_  
\_\_\_\_\_

pigment \_\_\_\_\_  
\_\_\_\_\_

rock art \_\_\_\_\_  
\_\_\_\_\_

shaman \_\_\_\_\_  
\_\_\_\_\_

supernatural \_\_\_\_\_  
\_\_\_\_\_

symbolic \_\_\_\_\_  
\_\_\_\_\_

territory \_\_\_\_\_  
\_\_\_\_\_



## LESSON 3E—ARCH ACTIVITY: ANCIENT ARTISTS

**Grades:** 3-8

**Time:** 45 minutes

**Content Area:** science, communication,  
writing, and arts

**Who:** whole class and small groups

**Materials:**

paper (or rocks)

pencils

markers

rock art images

Arch Journal

### OBJECTIVE AND OUTCOME

- Students will learn about prehistoric symbols.

- Students will create their own rock art panel and interpret others' panels.

- Students will gain an understanding of the need to protect rock art for the future.

- Students will write a radio commercial for protection of rock art.

### ACTIVITY

1. Discuss with students the meaning of the words pictograph, petroglyph, and rock art (see narrative). Explain that they will create a pictograph during this activity.

2. Give each student a piece of paper. Have them use pencils and

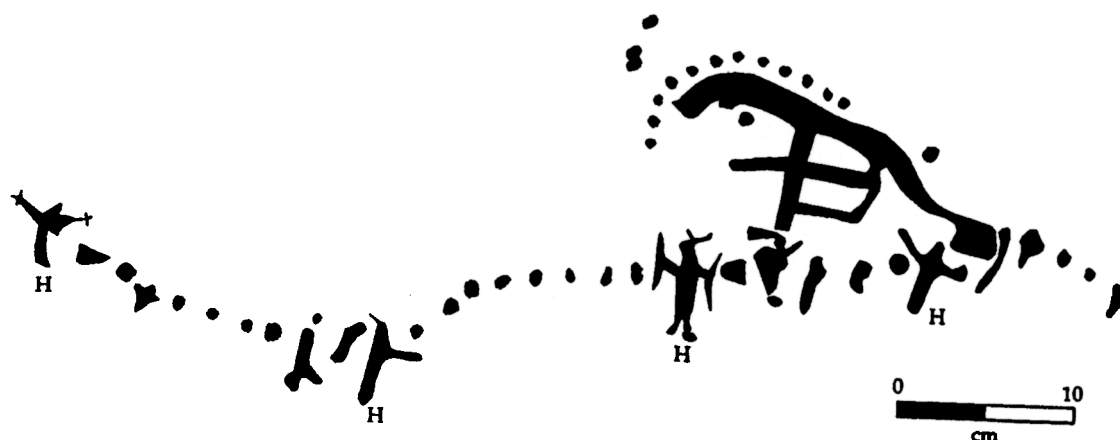
color markers to create a single or simple set of symbols that tell a story of some event that happened to them. Have students imagine that this event happened to them 2,000 years ago. As an alternative, have them design a symbol that represents themselves or some other object. Ask the students to use symbols as if they were living 2,000 years ago.

3. Give students 10 minutes to make their "pictograph." When they are finished, have them trade with a partner and try to "read" each other's stories or interpret their partner's symbol.

4. As a class, discuss what clues people used to decipher the symbols.

5. Project the rock art images from the Red Bluff Cave on the Smith River

Rock art at Red Bluff Cave, Meagher County, Montana.



on a transparency. Tell students that archaeologists are not sure what these images mean, but that they think the symbols labeled with an "H" represent humans. Ask students, after they have viewed the symbols, to write answers to the following questions:

- ~ What do you think the symbols mean?

- ~ Why did people create them?

- ~ Is there a message in the symbols? What is it?

- ~ What can archaeologists learn from studying these images?

- ~ What information would be lost if they were destroyed?

6. With their partners, have students write a 40-second radio commercial to promote the protection of rock art. Then have each team present its commercial to the class.

#### **EXTENSIONS**

3–5:

- Research vocabulary.

See: Lesson 3E—Vocabulary

- Complete this activity using finger paint or natural materials the students bring from home instead of pencils and markers.

6–8:

- Challenge students to read an article about rock art.

- Challenge students to learn about how rock art can be dated.

### LESSON 3F—NARRATIVE: HOW DO ARCHAEOLOGISTS ANALYZE AND DATE ANCIENT TECHNOLOGY?

*Several scientific methods of analysis and dating assist archaeologists in their study of ancient technology.*

Archaeologists study artifacts to learn how they were made and used. Knowing the age of an artifact is also of extreme importance. When archaeologists know when different artifacts were created, they can compile a **chronology** of past events. A chronology is a sequence, or timeline, showing changes over time in lifeways, including changes in tool technology, subsistence strategies, dwellings, clothing, and expression through art. The past cannot be reconstructed without a sequential knowledge of these events.

Archaeologists often study the shape and size of stone artifacts. In Montana, stone projectile point size and style changed over time. Since some types of points and other tools were only made at certain times, these tools help archaeologists determine how old a site is. Archaeologists also study the **chemical composition**, or make-up, of stone material. Some stone, like obsidian, can be traced to its source by studying its chemical composition. Information about prehistoric travel and trade can be obtained in this way. Archaeologists also research stone quarrying and tool manufacture methods. By studying the tool and the stone waste flakes, or unusable pieces produced when making the tool, archaeologists can reconstruct specific **stone tool manufacture** techniques. By studying the different kinds of waste flakes

found, archaeologists may be able to determine the type of tool knapped at a site even if they don't find the artifact itself!

Archaeologists also gather information through **microscopic** study of stone tools and implements. The edges of scrapers and butchering tools sometimes show wear patterns and **blood residue** from butchered animals. These clues identify what foods were consumed at the site. Very much like detective work, this is an exciting area of archaeological research.

The ages of artifacts made of bone, charcoal, antler, or wood can be determined by **radiocarbon dating**. Pictographs can also be radiocarbon dated if prehistoric artists used organic materials to bind the paint. In 1949, Willard Libby discovered radiocarbon dating. The method revolutionized archaeology because it told archaeologists how old—in years before the present—their sites were. Dr. Libby won the Nobel Prize for this invention. The basic principle behind radiocarbon dating is simple. All organic material contains some minute **radioactive elements** that break down and release energy at a constant rate, or **half-life**. In radiocarbon dating, scientists measure the amount of release, or decay, as elements change from radioactive **carbon-14** to non-radioactive, or stable, nitrogen-14. In an organic object like a tree or the skeleton of an animal, the ratio of

radioactive elements stays the same until the living material dies and no new elements are added. Scientists compare the amount of both elements remaining in archaeological bones or charcoal from a campfire to determine how much radioactive decay has occurred and thus the number of years that have passed since the death of the living object. Radiocarbon dating is accurate in determining the age of organic artifacts as old as forty thousand years! Many hundreds of radiocarbon dates have been obtained from archaeological sites across Montana. They range from almost twelve thousand to one hundred years ago. In radiocarbon dating, "B.P." is sometimes used to indicate how old something is "Before the Present."

Another method of dating wood artifacts is **dendrochronology**, or tree ring dating. This method relies on the pattern of annual, or yearly, growth in tree rings. A tree cut at a known date is compared with progressively older tree rings. This process establishes a "tree growth" chronology over many centuries. The tree rings in wood found in an archaeological site can be compared to this chronology. By matching the sequence of rings and counting back in time, the age of the wood can be determined along with the age of the site. But dendrochronology is limited to certain areas where the proper tree species are available and tree segments have been preserved. For these reasons, tree ring dating is not widely used in Montana. One exception is using tree rings to date cambium-peeled "scarred" trees in western Montana; the cambium was

used as food.

For Montana archaeological sites, another useful dating method is **obsidian hydration dating**. Geologists Irving Friedman and Robert Smith discovered this method of dating in 1948. Obsidian artifacts absorb water, or hydrate, at a specific rate. Freshly knapped obsidian begins to absorb water on its newly exposed surfaces. Water penetrates deeper into the surface over time. By measuring the thickness of the **hydration rind**, archaeologists can estimate the relative age of two artifacts. The obsidian artifact with the thicker hydration line is older. If a hydration rate for the area has been established, the artifact can also be given a precise date. One problem with this method is that rates of hydration are difficult to determine and are not uniform from one location to another.

Archaeologists use other methods to date certain kinds of artifacts. The age of bones can be determined by **amino acid** dating. This process measures the amount of decay of protein molecules within bone. Rock art can be dated by **superimpositioning** and by **figure content cross dating**. Superimpositioning assumes that if one design is painted on top of another, the underlying design was painted first and is oldest, just like the law of stratigraphy. Figure content cross dating compares rock art designs within a given area, and those that are the same or similar are assumed to be made during the same period of time. This same principle is used to say that two projectile points that look alike are probably similar in age. Finally, pottery and even burnt

stone can be dated by **thermoluminescence**. This method measures the light energy a previously baked artifact gives off when it is heated again to a very high temperature. Older objects give off more light energy.

These are only a few of the specialized techniques used by archaeologists to study prehistoric sites and artifacts. Archaeologists also depend on methods and theories from many different scientific fields. **Geologists, botanists, zoologists, geographers** and many other specialists make up an **archaeological research team**. Every year, these scientists develop new technologies that help archaeologists. Without the help of these people, and many sophisticated techniques, we would know much less about Montana's ancient past. \

## LESSON 3F—VOCABULARY: HOW DO ARCHAEOLOGISTS ANALYZE INFORMATION ABOUT TECHNOLOGY?

amino acid dating \_\_\_\_\_  
\_\_\_\_\_

archaeological research team \_\_\_\_\_  
\_\_\_\_\_

blood residue \_\_\_\_\_  
\_\_\_\_\_

botanists \_\_\_\_\_  
\_\_\_\_\_

carbon-14 \_\_\_\_\_  
\_\_\_\_\_

chemical composition \_\_\_\_\_  
\_\_\_\_\_

chronology \_\_\_\_\_  
\_\_\_\_\_

dendrochronology \_\_\_\_\_  
\_\_\_\_\_

figure content cross dating \_\_\_\_\_  
\_\_\_\_\_

geographers \_\_\_\_\_  
\_\_\_\_\_

geologists \_\_\_\_\_  
\_\_\_\_\_

half-life \_\_\_\_\_  
\_\_\_\_\_

hydration rind \_\_\_\_\_  
\_\_\_\_\_

microscopic \_\_\_\_\_  
\_\_\_\_\_

obsidian hydration dating \_\_\_\_\_  
\_\_\_\_\_

radioactive elements \_\_\_\_\_  
\_\_\_\_\_

**LESSON 3F—VOCABULARY: HOW DO ARCHAEOLOGISTS ANALYZE INFORMATION ABOUT TECHNOLOGY? (CONTINUED)**

radiocarbon dating \_\_\_\_\_

\_\_\_\_\_

stone tool manufacture \_\_\_\_\_

\_\_\_\_\_

superimpositioning \_\_\_\_\_

\_\_\_\_\_

thermoluminescence \_\_\_\_\_

\_\_\_\_\_

zoologists \_\_\_\_\_

\_\_\_\_\_

## LESSON 3F—ARCH ACTIVITY: DETERMINING THE AGE OF ARTIFACTS

**Grades:** 6–8

**Time:** 30 minutes

**Content Area:** science and math

**Who:** individual and whole class

**Materials:**

calculator

paper and pencils

Arch Journal

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### OBJECTIVE AND OUTCOME

- Students will learn how archaeologists use obsidian artifacts to date sites.
- Students will compute the age of obsidian artifacts based on the hydration formula and the thickness (in microns) of the hydration rinds developed on these artifacts.

### ACTIVITY

1. Explain that the following hydration formula has been determined for the Government Mountain–Sitgreaves obsidian flow in the American Southwest, where  $Y$  is the computed date of an obsidian artifact based on  $x$ , its hydration rind measurement in microns.

Hydration Rate Formula

$$Y = 43.58 + 158.16(x^2 - x)$$

2. Using the formula, have each student compute the age of the artifacts listed below from two archaeological sites (Site 1 and Site 2).

### Example:

If an artifact has a hydration rind of 1.8 microns, then:

$$Y = 43.58 + 158.16 (1.8 \text{ squared} - 1.8)$$

$$Y = 43.58 + 158.16 (3.24 - 1.8)$$

$$Y = 43.58 + 158.16 (1.44)$$

$$Y = 43.58 + 227.75$$

$$Y = 271 \text{ years B.P. (before present)}$$

The artifact is 271 years old.

### Site

- \* small obsidian arrow point with a hydration rind of 1.6
- \* obsidian knife with hydration rind of 1.9
- \* obsidian scraper with a hydration rind of 1.95

### Site 2:

- \* obsidian arrow point with a hydration rind of 1.5
- \* obsidian flake with a hydration rind of 1.6
- \* obsidian knife with a hydration rind of 4.6
- \* obsidian spear point with a hydration rind of 8.3

3. Discuss with the whole class the differences between the two sites based on the age of the artifacts found there.

4. What could those differences mean? Why might people return to Site 2 over many thousands of years?

### EXTENSIONS

6–8:

- Research vocabulary.

See: Lesson 3F—Vocabulary

- Give students the age of four Government Mountain–Sitgreaves obsidian artifacts that are 213; 516; 1,244; and 3,648 years old. Challenge them to compute the thickness of the



hydration rind for each artifact using the hydration rate formula.

- Challenge students to research other dating methods in archaeology that rely on mathematical formulas. Have them list and describe these other formulas in their Arch Journals.

### **Answers**

Site 1:

The arrow point is 195 years old.

The knife is 314 years old.

The scraper is 337 years old.

Site 2:

The arrow point is 162 years old.

The flake is 195 years old.

The knife is 2,663 years old.

The spear point is 9,626 years old.

Extension Exercise:

The hydration rinds are:

1.65 microns

2.3 microns

5.3 microns

3.3 microns

### **LESSON 3G—NARRATIVE: WHO IS AN ARCHAEOLOGIST WHO STUDIES ANCIENT TECHNOLOGY?**

*Ann M. Johnson is an archaeologist who studies ancient technology.*

**D**r. Ann M. Johnson is an archaeologist who studies ancient technology—the manufacture and use of material objects needed in daily life by people of the past. Ann’s specialty is the study of prehistoric pottery, or ceramics, of the Northern Plains. When Ann was in graduate school, Montana prehistoric ceramics was an area no other student was studying, and she found the opportunity to make a contribution in the study of prehistoric ceramics attractive. The first Northern Plains prehistoric pottery found by archaeologists dates from about A.D. 400.

Ann directs her research at a range of cultures, from the group of prehistoric people just before pottery appeared, 1000 B.C., to the people at the beginning of the historic period. She also studies historic Native American sites so that she can more fully interpret the past.

When Ann studies pottery, she is first interested in the technology of a piece. She seeks clues about how it was made, where the clay was obtained, and how the pot was decorated. Then she focuses on the group of prehistoric people who made this particular type of pottery. Pottery tends to be culturally characteristic, that is, pots have qualities that help identify different prehistoric groups.

Ann states that the best way to study pottery is to examine it in person, and to look at a great deal of it. Pictures and words do not fully convey

the qualities that distinguish cultures and time periods. Someone who analyzes pottery—a ceramic analyst—also needs to keep good records and notes on the collections she has viewed. Similarities and differences in pottery translate into similarities and differences in cultures. Records and notes are then used to compare to collections viewed at a later time.

Ann was interested in archaeology at a young age and did her first field-work when she was eleven. She joined a field crew testing prehistoric sites near Havre, Montana. Ann attended elementary and secondary schools in Kalispell, Montana. Her post-secondary education was at the University of Montana and the University of Missouri. While in graduate school, she published her first archaeological article and worked on archaeological inventory and testing crews.

Ann spent a couple years working with the Colorado State Archaeologist’s Office and the Bureau of Land Management. She joined the National Park Service in 1980, and she has been the archaeologist for Yellowstone National Park since 1995. She says that the easiest part of her job is getting up and going to work, because she loves where she works and what she does! Ann says the most difficult part of her job is finding time to write articles presenting the information she has learned from her investigations. Her other work, with deadlines to meet, often takes priority over her writing.

As she studies the past, Ann is most intrigued by the relationships between the groups of people who inhabited the plains. There were two contrasting prehistoric lifestyles. One group were migratory, having no permanent home. They moved seasonally, gathering plant foods and hunting animals, primarily bison. The other group were villagers, who had permanent homes. They cultivated gardens with corn, beans, squash, and sunflowers, and they supplemented their agricultural products with summer hunts. These summer hunts would bring villagers west from the Dakotas to the eastern Montana plains, where the non-village groups lived. When evidence of contact between the two groups exists, their encounters were sometimes peaceful, and sometimes they were not.

Ann notes that the villagers made large numbers of excellent ceramics, while the non-village groups only occasionally made a few pots. Working for the National Park Service has given her the opportunity to study two sites in Yellowstone National Park known to contain prehistoric ceramics. These ceramics are identified as Intermountain ware and are found in Montana, Wyoming, and Idaho. Both Yellowstone ceramic sites are believed to represent prehistoric Shoshone Indians, a non-village people.

One of Ann's favorite Montana sites is Wahkpa Chu'gn, near Havre, where she did her first fieldwork. It is a large buffalo jump with processing areas and camp areas. Wahkpa Chu'gn was used from about A.D. 400 to 1600 by a series of different peoples. It has

never been vandalized, making it a valuable archaeological site. It also contains all the activities associated with the buffalo jump, allowing archaeologists to interpret the entire picture of how early people lived. The Wahkpa Chu'gn site is open to the public to visit.

Another of Ann's favorite sites is Nollmeyer, a village near Sidney, Montana. People at Nollmeyer moved from northern South Dakota to eastern Montana and built earth homes. They left behind many tools, pottery, and animal bones from their meals. These people also built a fortification ditch around their village. It must have been because their migratory neighbors were not friendly!

Ann has worked at sites in North and South Dakota, Montana, Colorado, Wyoming, and Missouri. An extensive project she worked on was in the mountain foothills outside of Denver, Colorado. During this project, Ann and her co-workers documented seven thousand years of prehistory with a series of rock shelter tests. Ann has also worked at sites in Saskatchewan, Canada, and Colombia, South America.

Ann would most like to find a Montana kiln site, a location where prehistoric pottery was fired to change it from dried clay to ceramics. If such a site were carefully excavated, much could be learned about how non-village people made pottery. She would study similarities and differences to the way village people made their pottery.

Ann says that thousands of sites are destroyed by development, erosion, and vandalism each day. Thus, the total number of sites is decreasing. She believes that, in the future, archaeolo-

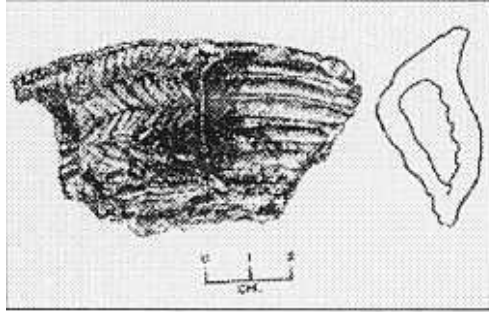
gists will investigate more sites through the use and reanalysis of museum collections.

Ann states that archaeologists should know a little about many subjects. If you are interested in the field of archaeology, it is helpful to have knowledge of botany and animal anatomy to identify plants and bones. Geography and geology assist in understanding the location of sites and stones used as tools. Math, statistics, biology, ecology, history, physics, earth science, and chemistry are essential courses. It is important to be able to read and write well. Computer skills are valuable. Students should also learn about the scientific method of how to formulate and test hypotheses.

Ann's message—as you learn more about archaeology—is: "Please remember that knowing where artifacts come from, the site and the location within the site, is very important to the proper interpretation of those artifacts."

When Ann is not studying pottery, she enjoys gardening and photography. Her family includes two sisters, a lawyer and a medical doctor. Students interested in archaeology may contact Ann at:

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Prehistoric pottery is not an artifact commonly found in Montana. When it does appear, it often reflects long-distance travel or trade between ancient groups. After studying this piece of pottery from Meagher County—a rim sherd with a handle—Ann Johnson concluded that it is most like pottery from the Middle Missouri area of South Dakota made between A.D. 1450 and A.D. 1700.



Since 1995, Ann Johnson has been the archaeologist for Yellowstone National Park. Ann began her career with the National Park Service in 1980.

### LESSON 3H—NARRATIVE: WHO IS AN ARCHAEOLOGIST WHO STUDIES ANCIENT TECHNOLOGY?

*Troy Helmick is an archaeologist who studies ancient technology.*

**T**roy Helmick is an archaeologist who studies ancient technology—the manufacture and use of material objects needed in daily life by people of the past. Troy grew up in central West Virginia, an area rich in historic and prehistoric sites. His interest in archaeology developed as he listened to his uncle tell Civil War stories and of finding “arrowheads” in cornfields. His fascination continued when he moved to Montana as a young adult. Troy then had the opportunity to discover Montana’s many archaeological sites and features.

Troy was curious to know more about ancient stone tools and weapons. He wanted to contribute correct information about lithics—objects made of stone by ancient people. He began flintknapping to understand the techniques and technology involved in creating those tools and weapons. He also studied the atlatl, a weapon used more than nine thousand years ago in North America. The atlatl is composed of a throwing board used to launch a long dart tipped with a projectile point. The atlatl was used until the bow and arrow replaced it as the preferred hunting weapon, about two thousand years ago.

Troy is an amateur archaeologist, working in the field out of personal interest rather than as a profession. He has made some important contributions with his experience. He has

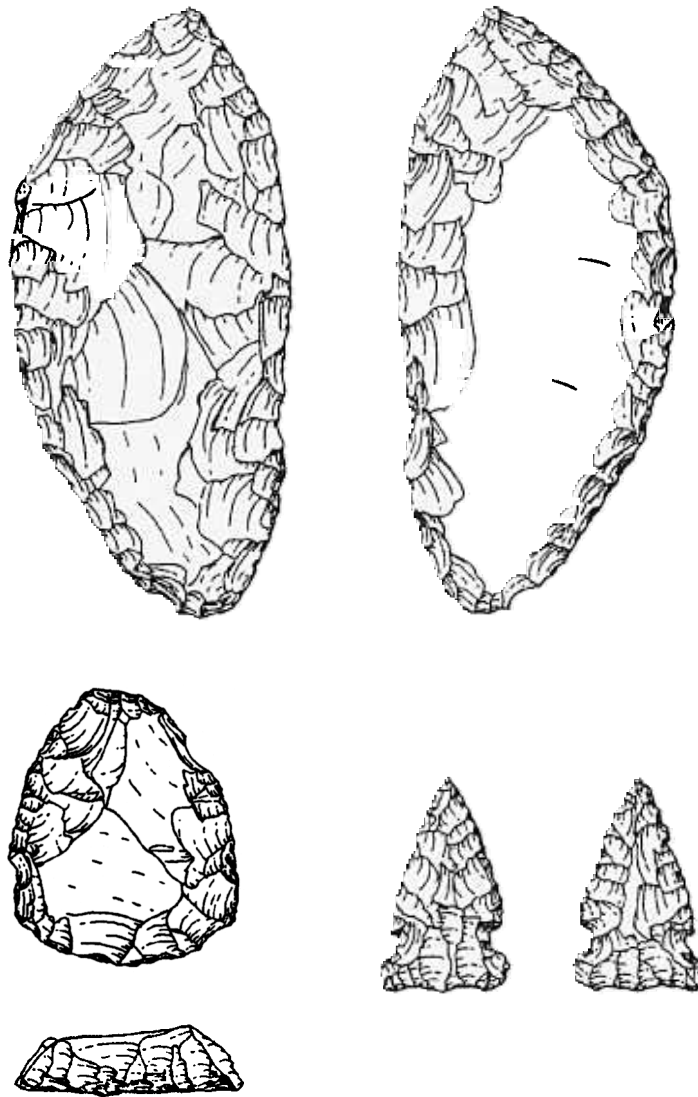
authored an article on atlatl weights found in Montana. These are stone artifacts and are the most commonly recovered pieces of an atlatl system besides the projectile point tips. Archaeologists have many ideas about the weight’s function. They test their theories by replicating the weapon and using it. No clear role of the weight has yet been determined. What archaeologists do know is that ancient atlatl hunters could effectively hit a target.

Archaeological interest in atlatls has led to competitions, both for research and fun. Troy participates in these atlatl competitions. He reports that the current world record distance for an atlatl-thrown dart is 258.6 meters!

Troy enjoys studying prehistoric archaeology because there are so many unanswered questions. It is very easy for him to stay interested in his search for answers. He says that the most difficult part of his work in archaeology is finding time to do everything he would like to accomplish.

Troy’s favorite location is Canyon Ferry Lake, near Helena. He has spent more than thirty years studying sites along the lakebed. More than four thousand artifacts from these sites have been catalogued. They represent ten thousand years of habitation! He feels that the importance of these finds is yet to be recognized and determined.

Troy Helmick draws scientific illustrations of artifacts for archaeologists. These detailed drawings help to show how an artifact was made. Here are three of Troy's drawings: a stone knife, an end-scraper, and a projectile point. *Courtesy Montana Historical Society.*



Troy has worked on many archaeological projects throughout Montana. He has done research for the Montana Historical Society Preservation Office, Helena, and worked on the Flying D Ranch Survey, Madison County. He has surveyed sites and worked as an archaeological aide for Dr. Leslie B. Davis of the Museum of the Rockies, Bozeman, and for Aaberg Cultural Research Consulting Service. The locations he has worked include Sheep Rock Springs, Steels Pass, Barton Gulch, Bowman Springs,

Lindsay Mammoth, Indian Creek, McHaffie, Dry Creek, KXGN, Bear Paw Springs, Merrel, and Mann Gulch.

Troy has carried out a variety of archaeological tasks working at those locations. He has located, identified, marked, and recorded artifacts, features, and sites. He has drafted cross-section and profile maps, as well as vicinity and location maps. Other work he has performed includes topographic surveys, horizontal and vertical grid layouts, sorting screened matrix to recover cultural materials,

and writing reports. In addition, he has drawn ink illustrations of stone and bone artifacts to include in site reports. His illustrations have appeared in numerous archaeology reports.

When Troy is not involved in archaeological activities, he spends time with his family. Troy and his wife, Shirley, live in Townsend, Montana. Their six children are Rhonda in West Virginia, Leslie Ann of Billings, Coleene living in Virginia, Charmon in nearby Helena, Brent in Naples, Italy, and Dean in California. Troy and Shirley have ten grandchildren! Hunting, fishing, photography, Lewis and Clark—and of course atlatl competitions and flintnapping—are among Troy's hobbies.

Students interested in archaeology may contact Troy at:

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Troy Helmick is a nationally recognized marksman in the use of the atlatl weapon system. Here he demonstrates the pieces of the atlatl to Ted Turner on the Flying D Ranch outside Bozeman, Montana. *Mark Baumlér, photographer. Courtesy Montana Historical Society.*